Field Control Insect Reports

RS
Pi - Insects

December 5, 1923

S(O)
Insect Control

Field Investigation of Effect of Insect Damage Changing Composition in Lodgepole Pine - Flint & Gisborne

MEMORANDUM

On October 30 to November 1 inclusive, a field examination was made of some of the areas of insect killed lodgepole pine in the vicinity of Monture Ranger Station on the Missoula National Forest. The purpose of the work was to secure more detailed information concerning the following phases of the insect infestation:

1. Amount and character of the damage in typical stands of lodgepole pine.

2. Composition and character of the remaining stand.

3. Influence of the insect work on fire risk.

4. Probable future of this stand from a silvicultural standpoint.

It is known that the area of recently killed lodgepole pine in this part of Montana is very great, and that it is rather steadily increasing. During the past year, fresh work has been observed on the Helena Forest and in the South Fork of the Flathead in the vicinity of Big Prairie. Fresh work is also reported in the Fortine and Wolf Creek districts of the Blackfeet Forest. Knowing this to be true, it is evident that studies similar to this one should be made to provide a basis for the formulation of a policy to govern insect control work. There is very little exact information available on the subject at this time. Control measures, if undertaken, will be expensive and should be based on full and accurate information.

From the best information available, it seems probable that the infestation in the vicinity of Monture Station first became of epidemic proportions about 1914, and that it had practically ceased on these particular areas by 1918. The epidemic appears to travel in a more or less progressive fashion over the lodgepole areas. Active work in a given tract apparently ceases when the most suitable host trees have been killed. The insects appear to choose moving to a new

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locality in preference to working on trees less than about six inches in diameter breast high. This belief is borne out by observations on a recent control project involving the treatment of about 500 lodgepole trees on the Helena National Forest. Of the infested trees on the Helena 79 per cent were in the dominant and codominant classes, and practically no trees six inches or less in diameter breast high were infested regardless of the fact that the stand was a dense even aged one with many trees of small diameter. There is no evidence that the epidemic near Monture was checked by any agent or condition other than the exahustion of the supply of suitable host trees.

In the vicinity of Monture Ranger Station, twenty or more chains of strip were run on each of three exposures; level bench at low altitude, (approximately 4100 feet above sea), steep northerly slope at approximately 5000 feet, and steep southerly slope at approximately 4500 to 5000 feet. All live and dead standing, or recently down, lodgepole and yellow pine trees, and all green trees of other species, 6 inches in diameter or larger, were tallied by two-inch diameter classes, using the quarter acre circular plot method. A six-inch diameter limit was chosen arbitrarily because it was apparent that but very few trees smaller than six inches D.B.H. had been attacked by insects. All live trees less than six inches D.B.H. and all reproduction and seedlings of all species were tallied by the mil-acre plot system, described by Lowdermilk in Applied Forestry Notes, August, 1917.

The tables which follow show what was found on the various strips and form most of the basis for such conclusions as are drawn.

SE OF SE Sec. 19, T.16 N., R.12 W.
20 chain strip. Flat. 140 year

	LODGEPOLE PINE					GREEN - OTHER SPECIES					
D.B.H.	Bug Killed Standing	Bug Killed Down	Dead Other Causes	Total Dead	Green	Bug Killed Y. P.	Doug Fir	Larch	Spruce	Bal-sam	Total
6	28	3	1	32	16	0	0	9	6	0	15
8	37	3	1	41	30	0	1	8	3	0	12
10	52	6	2	60	14	0	0	8	1	1	10
12	42	7	1	50	7	0	1	7	1	0	9
14	14	5		19	3	0	1	3	3	0	7
16	1	1		2	1	0	0	0	2	0	2
18	2			2		0		(30")1	0	0	1
Total	176	25	5	206	71		3	36	16	1	56
Percent	63	9	2	74	26						
No. per acre	88	12	3	103	35	0	2	18	8		28
						A total of 63 green trees per A.					

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SW of SE Sec. 19, T. 16 N., R. 12 W.
19 chain strip. Flat. 140 year

6	25	2	0	27	25	0	0	2	6	0	8
8	44	4	0	48	20	0	0	6	6	0	12
10	59	11	0	70	4	0	0	6	4	0	10
12	48	8	0	56	2	0	0	3	5	0	8
14	17	3	0	20	0	0	0	0	2	0	2
16	4	1	0	5	0	0	0	1	0	0	1
18	1	0	0	1	0	0	0	0	0	0	0
over18	0	0	0	0	0	0	0	8	0	0	8
Total	198	29	0	227	51	0	0	26	23	0	49
percent	72	10	0	82	18	0	0				
No. per Acre	10	15	0	119	27	0	0	14	12	0	26
						A total of 53 green trees per acre.					

SE¼ SW¼ Sec. 19, T. 16 N., R. 12 W.
20 chain strip. Flat. 110 year

D.B.H.	LODGEPOLE PINE: Bug Killed Standing	Bug Killed Down	Dead Other Causes	Total Dead	GREEN - OTHER SPECIES: Green	Bug Killed Y.P.	Dougl Fir	Larch	Spruce	Bal-sam	Total
6	54	2	1	57	68	0	1	15	0	1	17
8	65	5	2	72	44	0	1	14	0	0	15
10	73	12	1	86	3	0	0	17	0	0	17
12	18	4	1	23	0	0	0	12	0	0	12
14	2	0	0	2	0	0	0	2	0	0	2
Total	212	23	5	240	115	0	2	60	0	1	63
Percent	60	6	1	67	33	0					
No. per Acre	106	12	2	120	58	0	1	30	0	0	32
	A total of 84 green trees per A.										

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SE¼ Sec. 24, T. 16 N., R. 13 W.
30 chain strip. Southerly exposure. 60% Slope. 100 year.

6	20	0	7	27	33	0	5	1			6
8	72	5	9	86	33	3	8	2		1	11
10	75	5	3	83	10	6	14	0			14
12	35	7	2	44	4	10	20	6			26
14	9	1		10		8	16	2			18
16	1			1		7	6	1			7
18	0			0		3	4	0			4
20	0			0		2	3	0			3
22	0			0		1	2	0			2
24	0			0		0	2	0			2
Total	212	18	21	251	80	40	80	12	0	1	93
Percent	64	5	6	76	24	100					
No. per Acre	82	7	8	100	32	16	32	5	0	0	37
	A total of 69 green trees per Acre.										
	All Y.P. in this tally bug-killed, a few green ones seen.										

SE¼ Sec. 33 T. 16 N., R. 12W.
Northwesterly Exposure, 100% slope. 20 chain strip 200+ years

	LODGEPOLE PINE					GREEN - OTHER SPECIES					
D.B.H.	Bug Killed Standing	Bug Killed Down	Dead Other Causes	Total Dead	Green	Bug Killed Y.P.	Dougl Fir	Larch	Spruce	Bal-sam	Total
6	14	3	9	26	12	0	33	1	0	0	34
8	20	0	8	28	5	0	41	2	0	1	44
10	35	2	7	44	6	1	61	2	0	1	64
12	21	3	0	24	1	1	51	2	0	0	53
14	3	1	0	4	0	2	20	2	0	0	22
16		0	0	0	0	1	11	1	0	0	12
18		0	0	0	0		8	0	0	0	8
20		0	0	0	0		5	1	0	0	6
22		0	0	0	0		0	1	0	0	1
24		0	0	0	0		0	1	0	0	1
Total	93	9	24	126	24	5	230	13	0	2	245
Per cent	63	6	16	84	16	100					
No per Acre	46	4	12	63	12	2	115	6	0	1	122

A total of 134 green trees per A.
All Y.P. in this tally bug-killed, a few green ones seen.

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Combined Tally of 109 Chains of Strip
Including Three Exposures

No per Acre	82	10	5	97	31	4	29	13	½	4	46
Per cent	64	8	4	76	24	100					
Per cent based on all green trees					40		38	17		5	60

COMPOSITION OF STAND, THREE SLOPES.

Trees 6 inches D.B.H. and larger.

	Percentages Based on Number of Trees						
	Lodge-pole	Dougl. Fir	Larch	Spruce	Bal-sam	Yellow Pine	Other
Present Stand	40	38	17	Trace	5	Trace	Trace
Stand Before Insect Attack	72	16	7		2	2	Trace

Young Growth and Trees Under 6 inches D.B.H.

Present Stand	38	54	1	2+	2	1-	2

All Ages and Sizes

Present Stand	39	46	9	1	4-	Trace	1

Summary of Reproduction Tally

Insect-killed Lodgepole Area
near Monture R. S., Missoula Nat'l Forest.

All live reproduction five inches or less in d.b.h. tallied by mil-acres along lines shown. H. R. Flint and H. T. Gisborne, Oct. 30-Nov. 1, 1923.

Beginning 1 chain N of the SE corner, S. 19, T. 16 N., R. 12 W., Montana P.M. Line running due west. Compass variation 21 degrees east of north.

Strip Length	Per Cent of area bearing reprod.	Per Cent of area bearing no reprod.	Species	Per Acre		
				Bearing Reprod. #	This Strip #	Composition %
20 chains in SE/SE	51	49	PO	1706	870	71.6
			DF	372	190	15.6
			Sp	147	75	6.2
			L	68	35	2.9
			WWP	68	35	2.9
			YP	19	10	0.8
			Total	2380	1215	100.0
11.20 chains in SW/SE (Up to the creek)	19.6	80.4	SP	728	143	51.6
			PO	455	89	32.2
			DF	136	27	9.8
			L	45	9	3.2
			Bals	45	9	3.2
				1409	277	100.0
31.20 chains (Combining above tallies to cover that part of this strip east of the creek).	39.7	60.3	PO	1483	590	67.3
			DF	330	131	14.9
			Sp	250	99	11.3
			L	65	26	3.0
			WWP	56	22	2.5
			YP	16	6	0.7
			Bals	8	3	0.3
				2208	877	100.0
19 chains in SW/SE (1 chain in creek thrown out as non-forest area).	33.7	66.3	PO	1625	547	70.9
			Sp	328	110	14.2
			DF	266	89	11.5
			WWP	31	16	2.1
			L	16	5	0.65
			Bals	16	5	0.65
				2282	772	100.0
19.80 chains in SE/SW (20 links in Irrigation Ditch).	48.5	51.5	PO	2104	1020	93.6
			DF	62	30	2.7
			L	52	25	2.3
			Sp	21	10	0.9
			WWP	10	5	0.5
				2249	1090	100.0

Strip Length	Per Cent of area bearing reprod.	Per Cent of area bearing no reprod.	Species	Per Acre Bearing Reprod. #	Per Acre This Strip #	Composition %
27.60 chains (Combining above tallies covering that part of this strip west of the creek).	50.0	50.0	PO	2141	1070	89.5
			DF	145	72	6.0
			Sp	51	26	2.3
			L	36	18	1.5
			WWP	22	11	0.7
				2395	1197	100.0

From the E¼ Cor. S. 33, T. 16 N., R. 12 W., M.P.M. we ran south 10 chains, then S45°W 15 chains and began cruise from this point.

20 chains diagonally across S½ of SE¼	61.0	39.0	DF	3372	2059	92.0
			AF	147	90	4.0
			WBP	82	50	2.2
			PO	65	40	1.8
				3666	2239	100.0

Beginning at the S¼ Cor. S. 24, T. 16 N., R. 13 W., M.P.M. running due north.

7.50 chains	34.6	65.4	DF	1770	613	79.4
			PO	423	147	19.0
			YP	38	13	1.6
				2231	773	100.0

Beginning at the S¼ Cor. S. 24, T. 16 N., R. 13 W., M.P.M. and running due east.

22.50 chains	42.2	57.8	DF	1294	546	61.2
			PO	737	311	34.8
			YP	84	36	4.0
				2115	893	100.0
30.00 chains (Combining above tallies in S. 24).	40.3	59.7	DF	1397	563	65.2
			PO	669	270	31.3
			YP	74	30	3.5
				2140	863	100.0

Columns headed "Bearing Reprod. #" show the number of seedlings there would be per acre with every mil-acre occupied.

Columns headed "This Strip. #" show the number of seedlings per acre according to the actual distribution.

Composition percentages are the same for both columns.

Memo.

An increment borer was used on a number of trees to determine the age of the stands and to secure indications of the rate of growth.

From the standpoint of costs and results, it seems wholly impracticable to reduce the fire hazard on this area by any method of removal of the inflammable material, unless some market for the dead material opens up in the next few years. It is entirely improbable that such a market will appear because the material is suitable only for cordwood, mine material, charcoal, or some similar use, and it is not conveniently located with reference to existing means of transportation.

Should a fire occur on any of the areas examined, there are sufficient cone bearing lodgepole pine trees to practically insure a stand of lodgepole reproduction following the fire. In such event, the present stand of lodgepole timber, which has no sale value, would be lost, but the ground would probably not become unproductive because a new crop of lodgepole would immediately begin to lay on wood. Keeping these points in mind, it is apparent that this area is a low liability as compared to many others in the District.

Fire losses on the Missoula Forest for the period 1908 to 1919 inclusive, averaged three-fourths of one per cent of the net Forest area per annum, only half the average loss per annum for western Montana, or for the District, indicating that the hazard is relatively low, and the losses much less than in many other parts of the District. The protection organization has been greatly strengthened during the past four years, and for this area is now believed to be all that can be justified in comparison with other areas of greater hazard and higher values. This statement is made, taking into consideration the increased hazard due to insect depredations. Within these lodgepole areas examined, no traces of lightning stripes were found. This locality is not frequented during the dry season by great numbers of tourists or local campers, and there is no railroad or lumbering operation in the vicinity. Because of these conditions, fires are not of especially frequent occurrence.

Apparently, the dead trees begin to fall in considerable numbers through rotting off at the base about five years after they are killed. From about five years after killing the fall will probably be increasingly heavy for several years, and it will probably be twenty or more years after the trees are killed until practically all are down.

The control or prevention of destructive insect epidemics of this character in a stand of this kind is somewhat comparable to the control or prevention of fire in areas of low liability. In such cases in either fire or insect outbreaks, unlimited expenditures for suppression probably cannot be justified from any reasonable standpoint. If the outbreak can be taken vigorously in hand and controlled while it is very small, and cheaply controlled, action should, by all means, be undertaken. A similar policy has been in force in District One for several years with reference to fire suppression. (See page 101 of Instructions, Fire Protection, Northern District.) The case of fire differs from that of insects chiefly in that it often causes complete devastation and non-productiveness for many years while insects merely destroy a part of the existing stand and increase the fire risk in it.

Control action on an insect attack, if successful, may well be expected to prolong the life of the existing stand from ten to fifty years, perhaps even longer, depending on the age of the stand at the time it was attacked. It is an expedient remedy for an existing ill. True correction of the ill probably lies in an economic or utilization situation which will make possible the use of all timber as soon as it becomes mature, or as soon as an insect epidemic manifests itself, even though the timber lacks a little of maturity. The insect damage differs from that of fire in that the young growth and the soil are untouched by insects.

The most practical course for the immediate future, in lodgepole stands, appears to lie in prompt detection and reporting of incipient isolated epidemics, followed by vigorous control measures while the epidemics are still small in scope. Detection and reporting can be handled by the present Forest forces. Control will depend upon the availability of an ample emergency fund similar to the present Fire Fund. Congress appropriated $25,000 for use in this way during 1924 fiscal year. The appropriation should be continued from year to year in a larger amount and made available for emergency use only.

CONCLUSIONS.

Approximately 72% of all lodgepole pine on the strips was killed by the work of the Mountain Pine Beetle. (Dendroctonus monticolae.)

There remains alive on the ground an uneven age stand of mixed species in which lodgepole pine at present predominates, forming 40% of the total number of trees larger than 6 inches D.B.H. and 38% of the young growth.

Memo.

The remaining green stand bears a much higher precentage of other species, (Douglas fir, larch, balsam, and spruce in the order named) than the original stand.

In the original stand, before the insect attack, including all three slopes, lodgepole made up 72% of the trees 6 inches D.B.H. and larger, yellow pine 2%, and other species 26%.

In the present stand, including all three slopes, lodgepole makes up 40% of the green trees 6 inches D.B.H. and larger, yellow pine a trace, and other species 60%.

In the 200+ year old stand on the northerly slope, lodgepole is probably about to disappear as an important component of the stand, since it now comprises only 9% of the green trees over 6 inches D.B.H. and only 2% of the young growth.

Many of the remaining green lodgepole trees are badly suppressed individuals of low or doubtful value as growing stock.

On approximately 20% of the lodgepole 140 years or less of age, the borings showed conclusive evidence of accelerated growth since the thinning by insects.

Most of the Douglas fir, spruce and larch in the stands 140 years of age and younger are sufficiently young and vigorous to make a good growth in the future. Some of the individuals show accelerated growth since the killing of the pine.

Many years, perhaps a full rotation, must pass before the stand again contains a volume of green timber equivalent to that which was on the ground just prior to the insect epidemic.

Of the seedlings 5 years of age and younger, a strikingly large percentage is Douglas fir.

The ground cover is still sufficiently complete to prevent erosion or soil deterioration.

The intensity of any fire that may occur and the amount of labor necessary for its control have probably been practically doubled by the insect infestation.

All of the lodgepole on these strips appears from very abundant scars to have survived at least one surface fire in the last 70 years.

During the next ten years, falling dead timber will greatly increase the cost of trail and telephone maintenance in the insect killed areas.

Memo.

Diameter rather than age seems to determine the susceptibility of the tree or the stand to insect attack.

Lodgepole in mixed stands appears to be attacked as freely as that in pure.

There is a negligible amount of active insect work in evidence in the remaining green lodgepole.

Control work in this locality is unnecessary because the epidemic has exhausted the host and passed on.

The stand is gradually passing over from lodgepole to Douglas fir as the predominating species, probably a common and orderly occurrence in the plant succession of the region.

/s/ Howard R. Flint
/s/ H. T. Gisborne